

FD700

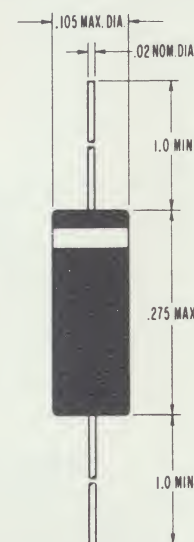
PICO-SECOND COMPUTER DIODE

The FD700 is a silicon planar epitaxial diode providing features necessary for ultra high speed logic circuitry: low capacitance, pico-second recovery times and controlled forward conductance. This device uses the planar process as developed by Fairchild to ensure the stability of surface-dependent characteristics against change with time. This factor, coupled with the most advanced manufacturing techniques from the planar wafer through assembly, guarantees the circuit designer of a continuing reliability in production quantities.

MAXIMUM RATINGS (25°C) [Note 1]

WIV	Working inverse voltage	20 V
I _o	Average rectified current	50 mA
i _r	Recurrent peak forward current	150 mA
i _r (surge)	Peak forward surge current, pulse width 1 sec	150 mA
P	Power dissipation	250 mW
1/θ	Power derating factor	2 mW/°C
T _A	Operating temperature	− 65°C to +150°C
T _{STG}	Storage temperature, ambient	− 65°C to +175°C

PHYSICAL DIMENSIONS



NOTES: All dimensions in inches.
See note 4.
Weight: 0.25 gram.

ELECTRICAL SPECIFICATIONS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	MAX.	UNITS	TEST CONDITIONS
V _{F1}	Forward Voltage	.89	1.1	Vdc	I _F = 50 mA
V _{F2}	Forward Voltage	.81	.95	Vdc	I _F = 20 mA
V _{F3}	Forward Voltage	.76	.88	Vdc	I _F = 10 mA
V _{F4}	Forward Voltage	.64	.74	Vdc	I _F = 1 mA
V _{F5}	Forward Voltage	.52	.61	Vdc	I _F = 0.1 mA
V _{F6}	Forward Voltage	.42	.50	Vdc	I _F = 0.01 mA
BV	Breakdown Voltage	30		Vdc	I _R = 5 μA
I _{R1}	Reverse Current		50	nA	V _R = 20 V
I _{R2}	Reverse Current (150°C)		50	μA	V _R = 20 V
t _{rr}	Reverse Recovery Time		700	pSec	See Table III
τ	Minority Carrier Lifetime		450	pSec	See Note 2
C	Capacitance [Note 3]		.75	pf	V _R = 0, f = 1.0 mc

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NOTES:

- (1) The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- (2) Measured as suggested by S. M. Krakauer, IRE Proceedings, Volume 60, July 1962, pp 1674-1675.
- (3) Capacitance as measured on Boonton Electronic Corporation Model No. 75A-S8 Capacitance Bridge or equivalent.
- (4) Leads are tinned. Gold plate with nickel strike may be obtained when specified.

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TYPICAL ELECTRICAL CHARACTERISTICS

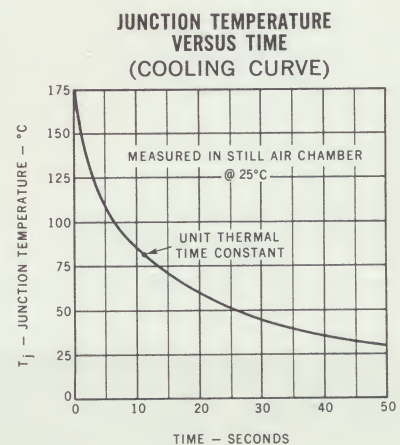
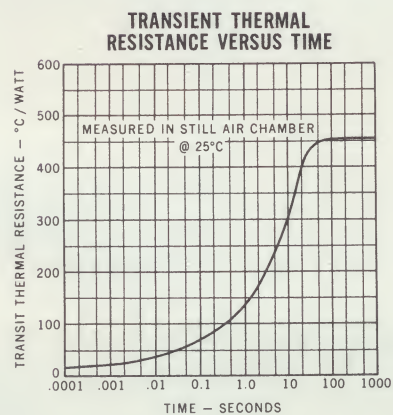
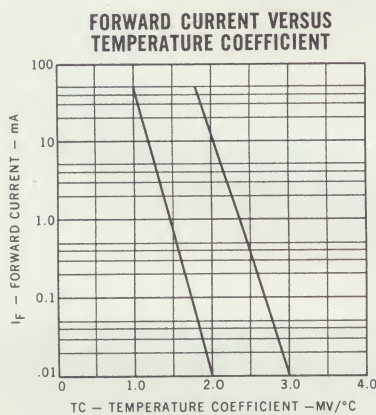
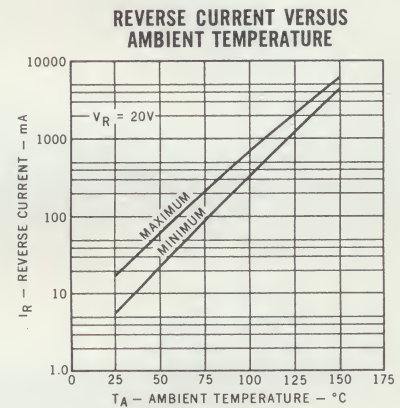
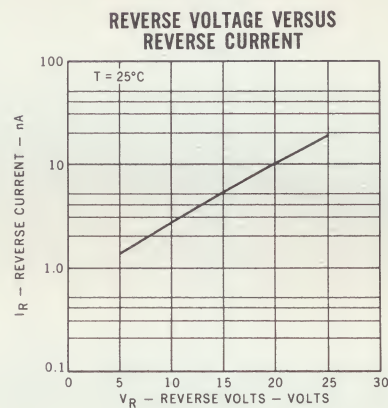
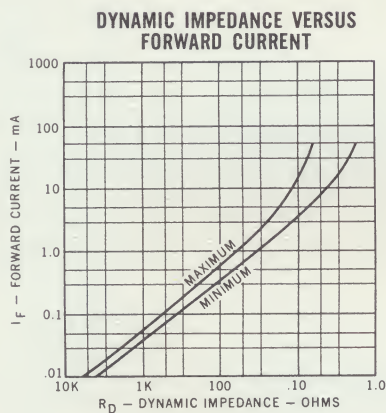
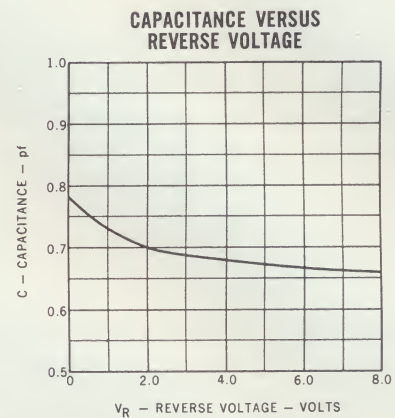
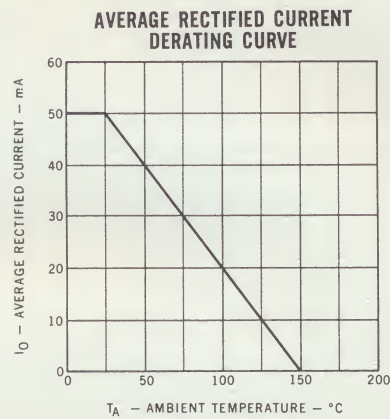
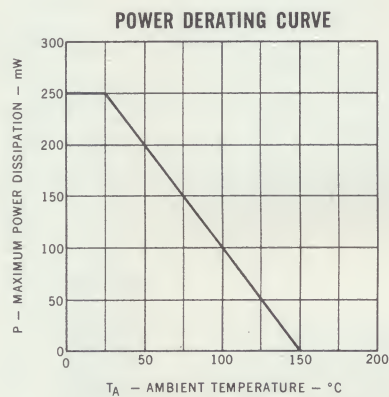


TABLE I

Part Number	Option (See paragraph 5.2)
FD700	Units supplied without data.
FD700-1	Units supplied with data summary by attributes.
FD700-2	Units supplied with variables data and statistical summary.
FD700-3	Units supplied with 100-hour burn-in as a process step and by attributes.
FD700-4	Units supplied with 100-hour burn-in as a process step and with variables data and statistical summary.

TABLE II — 100% PROCESSING

Test	Examination or Test	Conditions
1	High Temperature Stabilization	200°C min., 48 hours min.
2	Temperature Cycle	10 cycles 175°C to -65°C
3	Hermetic Seal	Hydraulic pressure of 100 PSIG for 2 hours (alcohol, water, and dye)
4	100-hour Burn-In (See note below)	$I_o = 50 \text{ mAdc}$, $V_{RMS} = 7$, $T_A = 25^\circ\text{C}$

NOTE: FD700-3 and FD700-4 only.

TABLE III — GROUP A INSPECTION

ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTICS	LIMITS MIN. MAX.	UNITS	SAMPLING LTPD %	TEST CONDITIONS	MIL-STD 750 Ref. Para.
SUBGROUP I				7		
	Visual and Mechanical					2066 & 2071
SUBGROUP II				7		
V_{F2}	Forward Voltage	.81 .95	V		$I_F = 20 \text{ mA}$	4011
BV	Breakdown Voltage	30	V		$I_R = 5 \mu\text{A}$	4021
I_{R1}	Reverse Current		50 nA		$V_R = 20 \text{ V}$	4016
SUBGROUP III				10		
V_{F1}	Forward Voltage	.89	1.1 V		$I_F = 50 \text{ mA}$	4011
V_{F3}	Forward Voltage	.76	.88 V		$I_F = 10 \text{ mA}$	4011
V_{F4}	Forward Voltage	.64	.74 V		$I_F = 1 \text{ mA}$	4011
V_{F5}	Forward Voltage	.52	.61 V		$I_F = 0.1 \text{ mA}$	4011
V_{F6}	Forward Voltage	.42	.50 V		$I_F = 0.01 \text{ mA}$	4011
I_{R2}	Reverse Current (150°C)		50 μA		$V_R = 20 \text{ V}$	4016
C	Capacitance		.75 pf		$V_R = 0$, $F = 1 \text{ mc}$	4001
t_{rr}	Reverse Recovery Time		700 pSec		See Note 1	4031

Note 1: $I_F = I_R = 10 \text{ mA}$, $R_L = 100 \text{ ohms}$, recover to 1 mA
Pulse generator rise time $\leq 0.25 \text{ nSec}$
Detector rise time $\leq 0.1 \text{ nSec}$

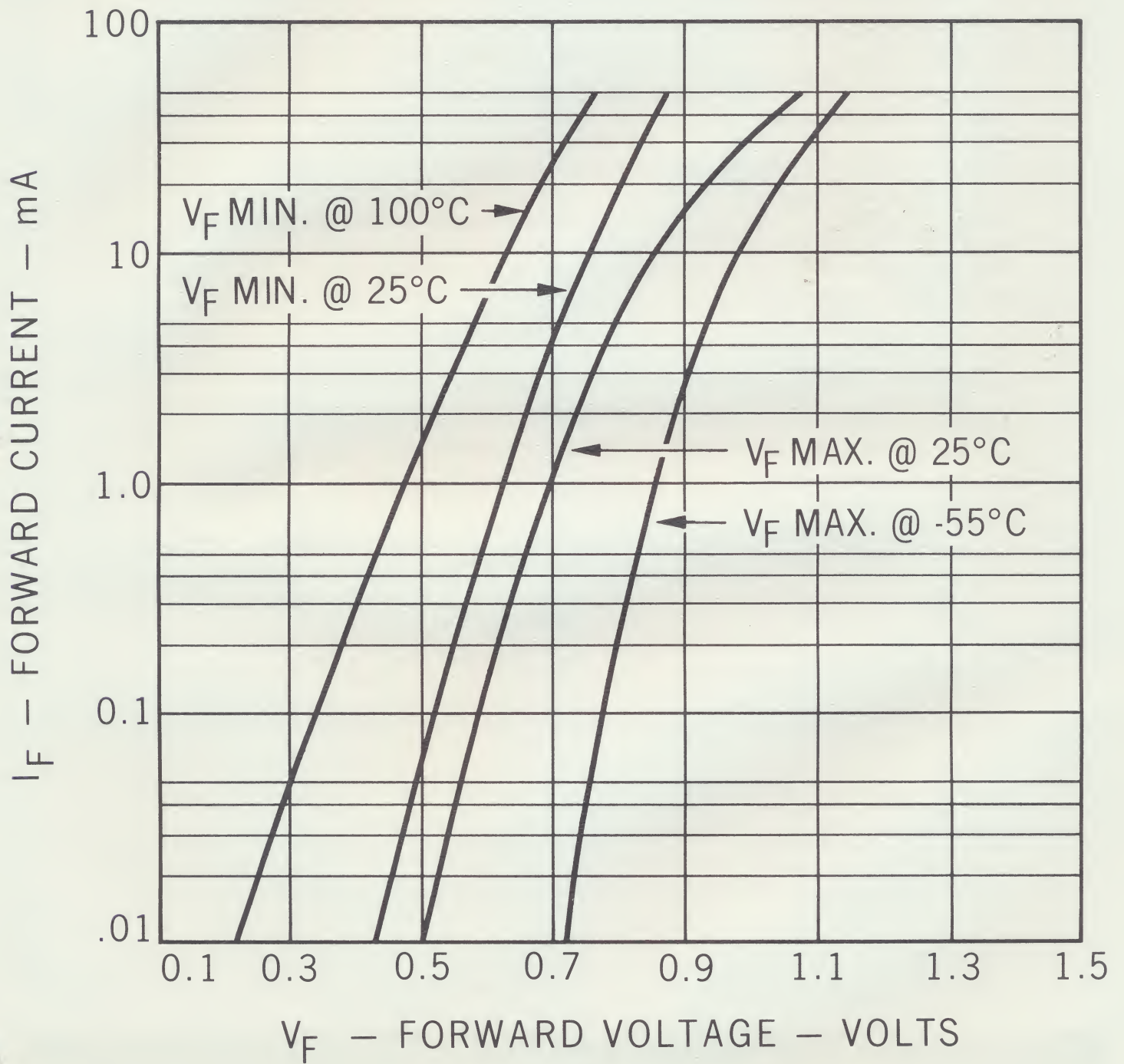
TABLE IV — GROUP B INSPECTION

MIL-STD-750 Ref. Para.	Examination or Test	Conditions (T _A = 25°C, unless otherwise specified)		Min. Sample Size	Min. Accept No.
2066 & 2071	Subgroup I			260	0
	Visual and Mechanical Examination				
2026 & 2031 1051 Condition C 1056 Condition A 1021	Subgroup II			25	0
	Solder	15 seconds immersion @ 230°C			
	Temperature Cycling	−65°C to +200°C, 10 cycles, 25 minutes @ extreme cycle			
	Thermal Shock	Water @ 0°C to 100°C, 10 cycles, 30 sec. @ extreme cycle			
2016 2006 2046 2056	Moisture Resistance	MIL-STD			
	Subgroup III			25	0
	Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G			
	Constant Acceleration	20,000 G, orientation of X _i , Y _i , Y ₂ , and Z _i			
	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations			
	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations			
2036 Condition E 2036 Condition A	Subgroup IV			25	0
	Lead Fatigue	1 pound, 3-90° arcs			
	Tension Test	3-pound weight for 30 seconds			
	Seal Test	100 PSIG hydraulic test, 2 hours			
1041 & 1046	Subgroup V			25	0
	Salt Spray	MIL-STD			
	Subgroup VI			80	1
1031	High Temperature Life	T _A = 150°C, 1000 hours			
1026	Subgroup VII			80	1
	Operational Life	V _{RMS} = 7, I _o = 50 mAdc			
	End Points: Subgroups II through V:	Symbol	Limits Min. Max.		Unit
4011	Forward Voltage	I _F = 20 mA	V _F	.95	Vdc
4016	Reverse Current	V _R = 20 V	I _R	50	nA
	End Points: Subgroups VI and VII:				
4011	Forward Voltage	I _F = 20 mA	V _F	1.05	Vdc
4016	Reverse Current	V _R = 20 V	I _R	100	nA
4001	Capacitance	V _R = 0, f = 1 mc	C	.8	pf

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FORWARD VOLTAGE VERSUS FORWARD CURRENT



NOTE TO BUYERS:

This document is a complete procurement specification known as FACT, which can be referred to as a purchase contract. It provides the options shown in Table I. The FACT Program is the customer's assurance of a continuing line audit testing program designed to analyze and guarantee the reliability of Fairchild diodes. Weekly samples from the production line are accumulated on a daily basis and subjected to a series of environmental tests, as described in Table IV. The resulting data is then programmed in a computer and various statistical measurements are made and compared with pre-test readings as well as historical line data.

Participants in the FACT Program are assured of:

- Low-cost reliability data. The cost of the program is borne by many purchasers instead of one.
- Availability. The entire product line is tested continuously, providing off-the-shelf delivery.

1.0 SCOPE

This specification covers detailed procurement requirements for high reliability silicon planar diodes. These devices are suitable for use in space vehicles and are capable of operation under the most stringent environmental conditions.

2.0 FAILURE RATES

The acceptance conditions for operational life, storage life, and environmental tests are assured by actual test. The estimated failure rate in conservatively designed circuits is based on engineering judgment and the relationship to devices actually tested by Fairchild. These tests indicate the feasibility of attaining a failure rate better than .001% per thousand hours. The vendor is not required to demonstrate this failure rate on devices shipped.

3.0 APPLICABLE DOCUMENTS

3.1 Testing Procedures: Test procedures shall conform to MIL-S-19500 and MIL-STD-750.

3.2 Sampling Procedures: Sampling procedures used are per MIL-S-19500, unless otherwise specified.

4.0 MISCELLANEOUS REQUIREMENTS

4.1 Packaging: Devices shall be packed in the vendor's standard package unless otherwise specified on the purchase order.

5.0 QUALITY AND RELIABILITY ASSURANCE PROVISIONS

5.1 100% Processing Steps: See Table II.

5.2 Normal Lot Acceptance: Each lot of devices shipped shall meet the requirements of Table III, Group A Inspection. Parts purchased as FD700-1 or FD700-3 shall be accompanied by attribute data; those purchased as FD700-2 or FD700-4 shall be accompanied by variables data. The data supplied is from the latest production lot submitted to Table IV, Group B inspection.

6.0 DEFINITIONS

6.1 LTPD (Lot Tolerance Percent Defective): This parameter of a sampling plan is the maximum percent defective which will be accepted by the sampling plan with 90% confidence.

6.2 Burn In: Devices which are ordered as FD700-3 or FD700-4 will have been operated for 100 hours as listed in Table II, prior to Group A inspection.

TABLE IV — GROUP B INSPECTION

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	Subgroup III			25	0
	Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G			
	Constant Acceleration	20,000 G, orientation of X _i , Y _i , Y _z , and Z _i			
	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations			
2036 Condition E 2036 Condition A	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations			
	Subgroup IV			25	0
	Lead Fatigue	1 pound, 3-90° arcs			
	Tension Test	3-pound weight for 30 seconds			
1041 & 1046	Seal Test	100 PSIG hydraulic test, 2 hours			
	Subgroup V			25	0
	Salt Spray	MIL-STD			
1031	Subgroup VI			80	1
	High Temperature Life	T _A = 150°C, 1000 hours			
1026	Subgroup VII			80	1
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			Min.	Max.	
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